an interior monitoring system, this problem can be solved. The presence of the resonator or reflector **604** on the top of the window glass also gives a positive indication of where the top surface is and reflections from below that point can be ignored.

[**0278**] Various design variations of the window monitoring system are possible and the particular choice will depend on the requirements of the vehicle manufacturer and the characteristics of the vehicle. Two systems will be briefly described here.

[**0279**] In the first example shown in **FIG. 16, a** single transmitter/receiver (transducer) **613** is used in place of and located centrally midway between the transducers **611** and **612** shown in **FIG. 16A**. A recording of the output of transducer **613** is made of the open window without an object in the space between the window edge and the top of the window frame. When in operation, the transducer **613** receives the return signal from the space it is monitoring and compares that signal with the stored signal referenced above. This is done by processor **601**. If the difference between the test signal and the stored signal indicates that there is a reflecting object in the monitored space, the window is prevented from closing in the express close mode. If the window is part way up, a reflection will be received from the edge of the window glass that, in most cases, is easily identifiable from the reflection of a hand for example. A simple algorithm based on the intensity, or timing, of the reflection in most cases is sufficient to determine that an object rather than the window edge is in the monitored space. In other cases, the algorithm is used to identify the window edge and ignore that reflection and all other reflections that are lower (i.e. later in time) than the window edge. In all cases, the system will default in not permitting the express close if there is any doubt. The operator can still close the window by holding the switch in the window closing position and the window will then close slowly as it now does in vehicles without the express close feature.

[**0280**] In the second system, two transducers **611** and **612** are used as shown in **FIG. 16**A and the processor **601** comprises a neural network. In this example the system is trained for all cases where the window is down and at intermediate locations. In operation, the transducers monitor the window space and feed the received signals to processor **601**. As long as the signals are similar to one of the signals for which the network was trained, the express close system is enabled. As before, the default is to suppress the express close.

[**0281**] An alternate technology to the use of resonators is to use an active or passive radio frequency identification tag (RFID tag) based on either a RF charged electronic circuit or a powerless surface acoustic wave technology (SAW). Such a tag can be placed on an object such as a seat or child seat and when interrogated it will return a signal usually containing an identification number.

[**0282**] The use of a resonator, RFID or SAW tag, or reflector, to determine whether the vehicle door is properly shut is illustrated in **FIG. 17**. In this case, the resonator **702** is placed in the B-pillar in such a manner that it is shielded by the door, or by a cover or other inhibiting mechanism (not shown) engaged by the door, and blocked or prevented from resonating when the door is closed. Resonator **702** provides waves **704**. If transducers such as **231** and **232** in **FIG. 3** are used in this system, the closed-door condition would be determined by the absence of a return signal from the B-pillar **702** resonator. This system permits the substitution of an inexpensive resonator for a more expensive and less reliable electrical switch plus wires.

[**0283**] The use of a resonator has been described above. For those cases where an infrared laser system is used, an optical mirror or reflector would replace the mechanical resonator used with the acoustic system. In the acoustic system, the resonator can be any of a variety of tuned resonating systems including an acoustic cavity or a vibrating mechanical element. As discussed above,a properly designed antenna,corner reflector,or a SAW device fulfills this function for radio frequency waves.

[**0284**] For the purposes herein, the word resonator will frequently be used to include any device that returns a signal when excited by a signal sent by another device through the air. Thus,resonator would include a resonating antenna,a reflector,a surface acoustic wave (SAW) device,an RFID tag,an acoustic resonator,or any other device that performs substantially the same function.

[**0285**] 11. Security and Recognition of an Individual

[**0286**] A neural network,or other pattern recognition system,can be trained to recognize certain people as permitted operators of a vehicle. In this case,if a non-recognized person attempts to operate the vehicle, the system can disable the vehicle and/or sound an alarm as illustrated in **FIG. 18**. In this figure the sensing transducers are shown as before as **231**A, **232**A and **233**A, the alarm system schematically as **708** and the alarm as **705**. Since it is unlikely that an unauthorized operator will resemble the authorized operator, the neural network system can be quite tolerant of differences in appearance of the operator. The system defaults to where a key must be used in the case that the system doesn't recognize the driver or the owner wishes to allow another person to operate the vehicle. The transducers **231**A, **232**A and **233**A are sensitive to infrared radiation and the operator is irradiated with infrared waves from transducer **231**A. This is necessary due to the small size of the features that need to be recognized for high accuracy of recognition. An alternate system uses an infrared laser,which can be **231**A in **FIG. 18**, to irradiate or illuminate the operator and a CCD or CMOS device,which can be represented as **232**A in **FIG. 18**, to receive the reflected image. In this case, the recognition of the operator is accomplished using a pattern recognition system such as described in Popesco, V. and Vincent, J. M. "Location of Facial Features Using a Boltzmann Machine to Implement Geometric Constraints", Chapter 14 of Lisboa, P. J. G. and Taylor, M. J. Editors, *Techniques and Applications of Neural Networks,* Ellis Horwood Publishers, New York, 1993. In the present case a larger CCD element array containing 100,000 or more elements would in many cases be used instead of the 16 by 16 or **256** element CCD array used by Popesco and Vincent.

[**0287**] Once a vehicle interior monitoring system employing a sophisticated pattern recognition system,such as a neural network or modular neural network, is in place, it is possible to monitor the motions of the driver over time and determine if he is falling asleep or has otherwise become incapacitated. In such an event, the vehicle can be caused to respond in a number of different ways. One such system is illustrated in **FIG. 19** and consists of a monitoring system